REMARKS/ARGUMENTS

The Applicants appreciate the Examiner's thorough examination of the Application and request reexamination and reconsideration of the Application in view of the following remarks. Claims 4-6 and 9-10 remain pending in the Application. Applicants have amended Claim 9 to correct a minor typographical error.

The subject invention results from the realization that, in a feedback system in which the output closely tracks the input, the error signal is small, and so rather than sample both the input and feedback signals before taking the difference to create the error signal, it is more efficient to form the error signal with a continuous-time (non-sampling) circuit followed by a gain stage and then sample this amplified error signal using a switched-capacitor circuit. This arrangement causes the input-referenced switch thermal noise to be reduced by the amount of the gain used in the error path. The amount of gain that can be used in the error path depends on how closely the output tracks the input; it is desirable to make this gain as large as possible without causing the error signal to exceed the supply voltage.

Claims 4-6 and 9-10 stand rejected under 35 U.S.C. §102(e) as allegedly being anticipated by U.S. Patent No. 6,304,608 to Chen et al. (hereinafter "Chen et al.") in view of U.S. Patent No. 5,805,093 to Heikkilä et al. (hereinafter "Heikkilä et al."). The Examiner asserts that the combination of these references is a multiple reference 35 U.S.C. §102 rejection.

Chen et al. shows a multi-bit sigma delta converter. As shown in Fig. 2, which the Examiner cites, a summing device 21 has two inputs that include an input voltage Vin and an analog feedback signal. The output of summing device 21 is fed to a loop filter 22 and then

an N-level quantizer 25. The output of quantizer 25 is fed to a decimation filter 28, which creates an output data word, and also to an element logic section 26. The output of element logic section 26 is input to a digital to analog converter (DAC) 27 which outputs the analog feedback signal to summing device 21. Chen et al., however, does not disclose an input circuit for receiving an input signal and a quantized feedback signal, as claimed by the Applicants.

Heikkilä et al. shows an oversampled high-order modulator. Fig. 1 of Heikkilä et al. shows a third order modulator in which quantizer 15 provides an output signal and a feedback signal which is fed to a switching means 20. Switching means 20 provides either a positive or negative voltage reference to scaling means 21, 22, 23 and 24, each of which scale the selected reference voltage. Heikkilä et al., similar to Chen et al., also does not disclose an input circuit for receiving an input signal and a quantized feedback signal for providing a signal representative of the difference, as claimed by the Applicants.

In contrast to Chen et al. and Heikkilä et al., the subject invention as claimed relates to an input circuit that receives not only an input signal but a quantized feedback signal and that provides a signal representative of the difference between the input signal and the quantized feedback signal. The input circuit also includes means for amplifying the difference between the input and the quantized feedback signal before it is submitted to a filter circuit. As noted in the subject Application at page 4, lines 13-15, this arrangement causes the input-referenced switched thermal noise to be reduced by the amount of the gain used in the error path.

Claim 4 of the subject invention recites: "A $\Sigma\Delta$ modulator with a filter system having reduced switch thermal noise comprising: an input circuit for receiving an input signal and a

quantized feedback signal and providing a signal representative of the difference; a filter circuit including at least an input sampling capacitor and switch which introduces thermal noise error; a quantizer circuit for quantizing the output of said filter circuit; a feedback circuit, responsive to said quantizer circuit, for delivering to said input circuit said quantized feedback signal; and said input circuit including means for amplifying said difference signal, before it is submitted to said filter circuit to reduce the input-referred thermal noise by a factor of approximately the gain of the amplification." (Emphasis added.) Neither Chen nor Heikkilä disclose or suggest, either alone or in combination, such a structure because neither disclose a ΣΔ modulator circuit having an input circuit for receiving an input signal and a quantized feedback signal and for providing a signal representative of the difference, nor does either disclose a feedback circuit for delivering to an input circuit a quantized feedback signal.

Also, neither Chen nor Heikkilä disclose the subject matter of independent claim 9, which recites: "A ΣΔ modulator with a filter system having reduced switch thermal noise comprising: a summing circuit for receiving an input signal and a quantized feedback signal and providing a signal representative of the difference; a filter circuit including at least an input sampling capacitor and switch which introduces thermal noise error; a quantizer circuit for quantizing the output of said filter circuit; a feedback circuit, responsive to said quantizer circuit, for delivering to said summing circuit said quantized feedback signal; and an amplifier circuit for amplifying said difference signal, before it is submitted to said filter circuit to reduce the input-referred thermal noise by a factor of approximately the gain of said amplifier circuit." Neither Chen nor Heikkilä discloses or suggests such a structure because neither discloses or suggests, either alone or in combination, a summing circuit for receiving

an input signal and a quantized feedback signal and for providing a signal representative of the difference, nor does either disclose a feedback circuit for delivering to an input circuit a quantized feedback signal.

The proper test of novelty under 35 U.S.C. §102 makes inquiry whether each element of the claim is embodied in a single prior art reference. National Athletic Supply Corp. v. Muscle-Matic, Inc. et al., 164 U.S.P.Q. 10 (D.C.M.Fla., 1968). The same or identical device or invention must be disclosed in a single prior art structure. Arnel Industries, Inc. v. Aerosol Research Co., 164 U.S.P.Q. 239 (D.C.N.Ill., 1969). There is no anticipation under 35 U.S.C. §102 unless there is a single reference that shows or suggests the structure and relationship of the parts defined in the claims. Hamilton Mfg. Co. v. Westinghouse Electric Corp., 164 U.S.P.Q. 284 (D.C.N.Ill., 1969).

Stated differently, the proper test for anticipation is whether the prior art reference describes the invention with such sufficient clarity and specificity that one skilled in the art could practice the invention without assistance from the Application claimed to have been anticipated. Columbia Broadcasting System v. Sylvania Electric Products, Inc., 162 U.S.P.Q. 577 (1st Cir., 1970). Certainly that is not the case here since neither Chen nor Heikkilä disclose or suggest whatsoever an input circuit for receiving an input signal and a quantized feedback signal and providing a signal representative of the difference.

Since claims 5, 6 and 10 depend from either independent claims 4 or 9, these claims are patentable for at least the reasons stated above, and further patentable because they each contain one or more additional features.

Accordingly, neither Chen nor Heikkilä disclose or suggest the structure of the claims of the subject Application as amended. Applicants respectfully request that the Examiner

remove the rejections under 35 U.S.C. §102(e).

Each of the Examiner's rejections has been addressed or traversed. Accordingly, it is respectfully submitted that the Application is in condition for allowance. Early and favorable action is respectfully requested.